

47. (Added) A liquid crystal display apparatus for displaying an image, comprising:

Sub G3
a substrate;

a plurality of switching elements being formed on said substrate;

a first electrode connected with said switching element and positioned over said switching element;

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a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode and a frame;

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a first orientation film formed on said optical reflector;

a second orientation film spaced apart from said first orientation film;

a second transparent electrode on which said second orientation film is formed;

a layer of liquid crystal material positioned between said first and second orientation films; and

a substantially nonconductive optical blocking means positioned between said first electrode and said switching element for blocking an incident light from leaking into said switching element.

Sub G4
48. (Added) The apparatus of claim 47, wherein said substantially nonconductive optical blocking means is a layer is formed of cadmium telluride.

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(Added) The apparatus of claim ¹⁶~~47~~, wherein said optical blocking layer is formed of germanium oxide.

50. (Added) A liquid crystal display apparatus for displaying an image, comprising:

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a substrate;

a plurality of switching elements being formed on said substrate;

a first electrode connected with said switching element and positioned over said switching element;

a frame composition disposed along an edge of said first electrode, with said frame composition being composed of optical blocking insulating material for blocking incident light from leaking into said switching element;

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a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a first orientation film formed on said optical reflector;

a second orientation film spaced apart from said first orientation film;

a second transparent electrode on which said second orientation film formed; and

a layer of liquid crystal material positioned between said first and second orientation films.

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51. (Added) The apparatus of claim 50, wherein said optical blocking material is cadmium telluride.

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52. (Added) The apparatus of claim 50, wherein said optical blocking material is germanium oxide.

Sub G8
53. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of switching elements being formed on said substrate;

a first electrode connected with said switching element and positioned over said switching element;

nonconductive optical blocking material formed under said first electrode;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a first orientation film formed on said optical reflector;

a second orientation film spaced apart from said first orientation film;

a second transparent electrode formed on said second orientation film;

and

a layer of liquid crystal material positioned between said first and second orientation films.

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(Added) The apparatus of claim ²²~~53~~, wherein said optical blocking material is cadmium telluride.

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~~55.~~

(Added) The apparatus of claim ²²~~53~~, wherein said optical blocking material is germanium oxide.

56. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of circuit elements being formed on said substrate;

a first electrode connected with said circuit element and positioned over said circuit element;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a first orientation film formed on said optical reflector;

a second orientation film spaced apart from said first orientation film;

a second transparent electrode on which said second orientation film is formed;

an oriented layer of liquid crystal material disposed between said first and second electrodes; and

optical blocking means positioned between said first electrode and said circuit element for blocking an incident light from leaking into said circuit element.

57. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of circuit elements being formed on said substrate;

a first electrode connected with said circuit element and positioned over said circuit element;

a frame disposed along the edge of said first electrode, with said frame comprising an optical blocking for blocking incident light from leaking into said switching element;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a first orientation film formed on said optical reflector;

a second orientation film spaced apart from said first orientation film;

a second transparent electrode; and

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an oriented layer of liquid crystal material positioned between said first and second electrodes.

58. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of circuit elements being formed on said substrate;

a first electrode connected with said circuit element and positioned over said circuit element;

optical blocking means formed under said first electrode;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a first orientation film formed on said optical reflector;

a second orientation film spaced apart from said first orientation film;

a second transparent electrode; and

an oriented layer of liquid crystal material positioned between said first and second electrodes.

59. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of switching elements being formed on said substrate;

a first electrode connected with said switching element and positioned over said switching element;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a second transparent electrode on which said second orientation film is formed;

an oriented layer of liquid crystal material positioned between said first and second electrodes; and

substantially nonconductive optical blocking means positioned between said first electrode and said switching element for blocking an incident light from leaking into said switching element.

60. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of switching elements being formed on said substrate;

a first electrode connected with said switching element and positioned over said switching element;

a frame disposed along an edge of said first electrode, with said frame comprising an optical blocking insulating material for blocking incident light from leaking into said switching element;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a second transparent electrode on which said second orientation film formed; and

an oriented layer of liquid crystal material positioned between said first and second electrodes.

61. (Added) A liquid crystal display apparatus for displaying an image, comprising:

a substrate;

a plurality of switching elements being formed on said substrate;

a first electrode connected with said switching element and positioned over said switching element;

nonconductive optical blocking material formed under said first electrode;

a storage capacitor connected with said first electrode and positioned under said first electrode;

an optical reflector formed on said first electrode;

a second transparent electrode formed on which said second orientation film; and

an oriented layer of liquid crystal material positioned between said first and second electrodes.

62. (Added) A spatial light modulator array for modulating light to form an image comprising:

a plurality of liquid crystal devices positioned over respective mirrors on a dielectric layer on a semiconductor substrate;

a plurality of electrical circuits formed in said semiconductor substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices;

an absorber layer positioned and patterned with respect to said mirrors for shielding said plurality of electrical circuits from ambient light, and

said absorber layer having an edge overlapping an edge of said mirror to form an overlapping region to decrease ambient light from passing into said semiconductor substrate.

63. (Added) A spatial light modulator array for modulating light to form an image comprising:

a plurality of liquid crystal devices positioned over respective mirrors on a dielectric layer on a semiconductor substrate;

a plurality of electrical circuits formed in said semiconductor substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices;

a reflector layer positioned and patterned with respect to said mirrors for shielding said plurality of electrical circuits from ambient light; and

said reflector layer having an edge overlapping an edge of said mirror to form an overlapping region to decrease ambient light from passing into said semiconductor substrate.

64. (Added) A method of forming a spatial light modulator array comprising the steps of:

forming a plurality of electrical circuits in a semiconductor substrate positioned for interconnecting with subsequently formed liquid crystal devices, respectively;

forming one or more layers of interconnections above said plurality of electrical circuits;

forming a first dielectric layer over said electrical circuits and said layers of interconnections;

planarizing said first dielectric layer to provide a substantially planar upper surface on said first dielectric layer;

forming an absorber layer, positioned and patterned with respect to subsequently formed liquid crystal devices for shielding said plurality of electrical circuits from ambient light,

forming a second dielectric layer above said patterned absorber layer;

forming studs through said second dielectric layer for electrical connection to subsequently formed mirrors;

forming a plurality of mirrors over said dielectric layer and patterned to form the lower electrode of said plurality of liquid crystal devices, said mirrors overlapping said absorber layer to form a capacitor with respect to said overlapping mirror and to attenuate light traveling between said absorber and said mirror;

forming plurality of spacers positioned in between selected mirrors of said plurality of mirrors;

applying a layer of liquid crystal material;

orienting said layer of liquid crystal material, and

forming a top electrode of said plurality of mirrors to form said plurality of liquid crystal devices.

65. (Added) A method of forming a spatial light modulator array comprising the steps of:

forming a plurality of electrical circuits in a semiconductor substrate positioned for interconnecting with subsequently formed liquid crystal devices, respectfully;

forming one or more layers of interconnections above said plurality of electrical circuits;

forming a first dielectric layer over said electrical circuits and said layers of interconnections;

planarizing said first dielectric layer to provide a substantially planar upper surface on said first dielectric layer;

forming an reflective layer, positioned and patterned with respect to subsequently formed liquid crystal devices for shielding said plurality of electrical circuits from ambient light;

forming a second dielectric layer above said patterned reflective layer;

forming studs through said second dielectric layer for electrical connection to subsequently formed mirrors;

forming a plurality of mirrors over said dielectric layer and patterned to form the lower electrode of said plurality of liquid crystal devices;

said mirrors overlapping said reflective layer to form a capacitor with respect to said overlapping mirror and to attenuate light traveling between said reflective and said mirror;

forming plurality of spacers positioned in between selected mirrors of said plurality of mirrors;

applying a layer of liquid crystal material;

orienting said layer of liquid crystal material; and

forming a top electrode of said plurality of mirrors to form said plurality of liquid crystal devices.

Sub G19
66. (Added) A liquid crystal display comprising:

a plurality of liquid crystal devices positioned over respective mirrors on a dielectric layer on a semiconductor substrate;

a plurality of electrical circuits formed in said semiconductor substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices; and

a light blocking layer positioned and patterned with respect to said mirrors for shielding said plurality of electrical circuits from ambient light;

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said light blocking layer having an edge overlapping an edge of said mirror to form an overlapping region to decrease ambient light from passing into said semiconductor substrate.

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Sub G20
67. (Added) A liquid crystal display comprising:

a plurality of liquid crystal devices positioned over respective mirrors on a dielectric layer on a semiconductor substrate;

a plurality of electrical circuits formed in said semiconductor substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices; and

a light blocking region positioned with respect to said mirrors for shielding said plurality of electrical circuits from ambient light;

said light blocking region being disposed between said mirrors to decrease ambient light from passing into said semiconductor substrate.

Sub G21
68. (Added) A liquid crystal apparatus comprising:

a plurality of liquid crystal devices positioned over respective mirrors on a dielectric layer on a semiconductor substrate;

a plurality of electrical circuits formed in said semiconductor substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices; and

a light blocking region positioned with respect to said mirrors for shielding said plurality of electrical circuits from ambient light.

Sub G22
69. (Added) A liquid crystal apparatus comprising:

a plurality of liquid crystal devices positioned over respective mirrors on substrate;

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a plurality of electrical circuits formed in said substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices; and

a light blocking region positioned with respect to said mirrors for shielding said plurality of electrical circuits from ambient light.

Sub G23
70. (Added) A liquid crystal apparatus comprising:

a plurality of liquid crystal devices positioned on substrate,

a plurality of electrical circuits formed in said substrate coupled to said liquid crystal devices, respectively, for placing a voltage across electrodes of said liquid crystal devices; and

a light blocking region positioned between said liquid crystal devices for shielding said plurality of electrical circuits from ambient light.

Sub G24 71. (Added) A display unit according to claim 39 wherein said first substrate has an insulation layer between said reflection electrode and said shading layer to form a holding capacitor.

Sub G25 72. (Added) A display unit according to claim 39 wherein said shading layer is comprised of a different material from said reflection electrodes.

Sub G26 73. (Added) A display unit according to claim 39 wherein said reflection electrodes are comprised primarily of Al and said shading layer is comprised primarily of a material selected from the group consisting of Ti and TiN and $Ti N_{0.33} Co_{0.67}$.

Sub G27 74. (Added) A display unit according to claim 39, wherein said shading layer reflects light to a different direction from said reflection electrodes to exhibit a different reflection characteristic.

Sub G28 75. (Added) A display unit according to claim 39, wherein said reflection electrodes are selected from the group consisting of aluminum and an aluminum alloy.

Sub G29 76. (Added) A display unit according to claim 44 wherein said shading layer is comprised primarily of a material selected from the group consisting of Ti and TiN and $Ti N_{0.33} Co_{0.67}$.